T R A N S L A T I O N

(19) JAPANESE PATENT OFFICE (JP)

(12) Official Gazette for Unexamined Patents(A)

(11) Japanese Application Publication Kokai No. 2002-13045
(P2002-13045A)

(43) Publication Date: January 18, 2002

(51) Int.Cl.[7]	ID Symbol	FI	Theme Code (Reference)
D 03 D 15/08		D 03 D 15/08	4L033
D 02 G 3/32		D 02 G 3/32	4L036
3/36		3/36	4L048
D 06 M 15/227		D 06 M 15/227	
15/263		15/263	
//D 06 M 101:32		D 06 M 101:32	
101:38		101:38	

F Terms (References) 4L033 AA07 AB05 AC12 CA12
CA18
4L036 MA05 MA33 MA37 MA39 PA05
PA33 PA46 RA24
4L048 AA21 AA26 AA51 AB17 AB19
AC12 CA04 DA01

Request for Examination: Not yet requested
Number of Claims: 12
OL
Total of 9 pages

(21) Application Number: 2000-196810 (P2000-196810)

(22) Application Date: June 29, 2000

(71) Applicant: 000003160
Toyo Boseki KK
(Toyobo Co. Ltd.)
Dojimahama, Kita-ku, Osaka City, Osaka-fu Japan

(72) Inventors: A. Nishida
c/o Toyobo Co., Ltd.
Dojimahama, Kita-ku, Osaka City

K. Sozo
c/o Toyobo Co., Ltd.
Dojimahama, Kita-ku, Osaka City

(54) [Title of/Invention]: **PROCESS FOR MANUFACTURE OF STRETCH WOVEN FABRICS**

(57) [Abstract]

[Problem to be Solved]

To provide a manufacturing process which enables the production of stretch woven fabrics with a fabric width per customers' order without creating problems such as irregular fabric width, weaving bars, shaded filling bands and the like.

[Means Used to Resolve the Problem]

A process for the manufacture of a stretch woven fabric which comprises weaving, as the warp, a sized and dried covered elastic yarn C and a synthetic multifilament yarn D.

[Claims]

[Claim 1]

A process for the manufacture of a stretch woven fabric which comprises weaving, as the warp, a sized and dried covered elastic yarn C and a synthetic multifilament yarn D.

[Claim 2]

A process for the manufacture of a stretch woven fabric as set forth in Claim 1, wherein said covered elastic yarn C is constituted of a polyurethane elastic yarn A and a synthetic fiber multifilament yarn B.

[Claim 3]

A process for the manufacture of a stretch woven fabric as set forth in Claim 1, wherein the covered elastic yarn C is prepared by twisting together a polyurethane elastic yarn A with a synthetic multifilament yarn B under a draft of a draw ratio at 2.0 to 4.0.

[Claim 4]

A process for the manufacture of a stretch woven fabric as set forth in Claim 1, wherein the sized covered elastic yarn C is dried under a state of tension, 0.6 to 1.0 times the draw ratio during the time when said covered elastic yarn C was manufactured at a temperature condition of 20°C to 70°C.

[Claim 5]

A process for the manufacture of a stretch woven product as set forth in Claim 1, wherein the synthetic fiber multifilament yarn B is a false-twisted yarn.

[Claim 6]

A process for the manufacture of a stretch woven fabric as set forth in Claim 1, wherein the synthetic fiber multifilament yarn B is a mixed polyester multifilament yarn containing at least partially a self-extendable polyester filament.

[Claim 7]

A process for the manufacture of a stretch woven fabric as set forth in Claim 1, wherein the sizing agent used for the covered elastic yarn C is a hot melt size type non-aqueous sizing agent comprised of a heat meltable polymer and a wax agent.

[Claim 8]

A process for the manufacture of a stretched woven fabric as set forth in Claim 1, wherein the covered elastic yarn C and synthetic fiber multifilament yarn D are arrayed alternatingly at a strand ratio of 1:1 to 1:4 threads as the warp into the formation of a woven fabric and wherein the yarn tension applied to the synthetic fiber multifilament yarn D during the sizing and/or warping in the weaving is 0.09 to 0.27cN/dtex.

[Claim 9]

The process for the manufacture of a stretch woven fabric as set forth in Claim 1, wherein the synthetic fiber multifilament yarn D is a mixed polyester multifilament yarn containing at least partially a self-extendable polyester filament.

[Claim 10]

A process for the manufacture of a stretch fabric as set forth in Claim 1, wherein the covering twist coefficient K for the covered elastic yarn C under draft-applied conditions is 3000 to 10000.

[Claim 11]

A process for the manufacture of a stretch woven fabric as set forth in Claim 1, wherein the sizing agent is applied after the covered elastic yarn C is manufactured, but before it is wound up.

[Claim 12]

A process for the manufacture of a stretch woven fabric as set forth in Claim 1, wherein the sizing agent is applied at 3 to 7% by weight of the fiber weight of the covered elastic yarn C.

[Detailed Description of the Invention]

[0001]

[Technical Field of this Invention]

The present invention relates to a process for the manufacture of a stretch woven fabric wherein a polyurethane elastic yarn is used in part of the woven fabric, specifically to a process for the manufacture of a stretch woven fabric which is suitable for an apparel application, the fabric having a suitable extensibility in the warp direction.

[0002]

warp instead of weft.

[Prior Art]

Many stretch woven fabrics are on the market that generally are composites of synthetic fiber multifilament yarns such as polyester, polyamide, and the like, with a polyurethane elastic yarn. These products provide a suitable degree of stretchability as effected by the polyurethane elastic yarn, but the main stream products are generally stretchable in the weft direction. However, imparting stretchability in the weft direction has been problematic in that a broad width loom is needed because the loom reed-in width needs to be expanded with adequate attention paid to the stretch ratio of the woven fabric and the weft insertion is reduced by the amount of the expanded reed-in width, as is the weaving efficiency, resulting in a higher weaving cost per roll.

[0003]

There have been additional problems in that a yarn tension readily varied during processing at a weft switch-over step, tending to inflict deficiencies such as woven fabric width irregularity, weaving bars, shaded filling bands, and the like; and that the loom temple caused yarn breaks and an accompanying core-loss of the polyurethane elastic yarn, thereby substantially hurting the appearance of the woven fabric.

[0004]

[Problem to be Solved by the Invention] weft ⟹ warp

The present invention addresses improving on the above-mentioned conventional deficiencies and offering a highly stretchable and warp-extendable stretch woven fabric with excellent appearance and hand which fabric is comprised of an alternating array, as the warp, of a covered elastic yarn that is constituted of a polyurethane elastic yarn and a synthetic fiber multifilament yarn and of another synthetic fiber multifilament yarn; in particular, overcoming the problem of any loss in production efficiency by not allowing the breakdown of the polyurethane elastic yarn due to friction or tension that said covered elastic yarn experiences during its warping and weaving.

[0005]

[Means Used to Solve the Problem]

That is, present invention is a process for the manufacture of a stretch woven fabric which comprises weaving, as the warp, a sized and dried covered elastic yarn C and a synthetic multifilament yarn D. Specifically, it is

a process for the manufacture of a stretch woven fabric as set forth above, wherein said covered elastic yarn C is constituted of a polyurethane elastic yarn A and a synthetic fiber multifilament yarn B; a process for the manufacture of a stretch woven fabric as set forth above, wherein the covered elastic yarn C is prepared by twisting together a polyurethane elastic yarn A with a synthetic multifilament yarn B under a draft of a draw ratio at 2.0 to 4.0; a process for the manufacture of a stretch woven fabric as set forth above, wherein the sized covered elastic yarn C is dried under a state of a tension, 0.6 to 1.0 times the draw ratio during the time when said covered elastic yarn C was manufactured at a temperature condition of 20°C to 70°C; a process for the manufacture of a stretch woven product as set forth above, wherein the synthetic fiber multifilament yarn B is a false-twisted yarn; a process for the manufacture of a stretch woven fabric as set forth above, wherein the synthetic fiber multifilament yarn B is a mixed polyester multifilament yarn containing at least partially a self-extendable polyester filament; a process for the manufacture of a stretch woven fabric as set forth above, wherein the sizing agent used for the covered elastic yarn C is a hot melt size type non-aqueous sizing agent comprised of a heat meltable polymer and a wax agent;

a process for the manufacture of a stretch woven fabric as set forth above, wherein the covered elastic yarn C and synthetic fiber multifilament yarn D are arrayed alternatingly at a strand ratio of 1:1 to 1:4 threads as the warp into the formation of a woven fabric and wherein the yarn tension applied to the synthetic fiber multifilament yarn D during the sizing and/or warping in the weaving is 0.09 to 0.27cN/dtex; a process for the manufacture of a stretch woven fabric as set forth above, wherein the synthetic fiber multifilament yarn D is a mixed polyester multifilament yarn containing at least partially a self-extendable polyester filament; a process for the manufacture of a stretch fabric as set forth above, wherein the covering twist coefficient K for the covered elastic yarn C under draft-applied conditions is 3000 to 10000; a process for the manufacture of a stretch woven fabric as set forth above, wherein the sizing agent is applied after the covered elastic yarn C is manufactured, but before it is wound up; a process for the manufacture of a stretch woven fabric as set forth above, wherein the sizing agent is applied at 3 to 7% by weight of the fiber weight of the covered elastic yarn C. Now the present invention is described in detail as below.

[0006]

The polyurethane elastic yarn employed in this invention uses a copolymer prepared as a polyurethane resin by allowing a polyisocyanate and a polyol to react generating a urethane prepolymer, and adding an amine as a chain extender in the presence of a solvent. The polyurethane resin is obtained by treating an isocyanate component using an aromatic diisocyanate an aliphatic diisocyanate, an alicyclic diisocyanate alone or a mixture thereof with a polyol component such as a polyether polyol, a polyester polyol, or the like, into the formation of a urethane prepolymer and then adding, for a reaction, an amine such as a primary amine such as hydrazine, ethylene diamine, propane diamine, or the like, a secondary amine such as a dialkylamine, or the like, a tertiary amine such as a trialkyl amine , and an alcoholic amine or the like. Depending on the application, an additive such as an UV absorber, an antioxidant, an anti-yellowing agent, a smoothening agent, a delusterant, a light stabilizer, or the like, may be added, followed by freeing the resin of the solvent by dry type spinning, and applying a suitable amount of a spinning oiling agent into the formation of a polyurethane elastic yarn. The solvent which may be used in the dry spinning method preferably includes a volatile organic solvent such as acetone, methylethyl ketone, or the like.

[0007]

The covered elastic yarn C used in the stretch woven fabrics preferably assumes a conventional covered yarn configuration as obtained by winding a synthetic fiber multifilament yarn around the above polyurethane elastic yarn, while extending it under a suitable draft and using a bored spindle. In addition to a singly covered yarn, the covering configuration can include a doubly covered yarn configuration by using two bored spindles for the synthetic fiber multifilament yarns, thereby doubly winding around with each in a different twisting direction. An air-covered yarn using an air jet nozzle, although highly attractive costwise, is not preferred because it is highly possible for the polyurethane elastic yarn to undergo a thread-exposure by such a [harsh] treatment during weaving or for the synthetic fiber multifilament yarn to deviate causing a nep-like defect, with the risk of substantially damaging the appearance and quality of the finished woven fabric. Using the above conventional covered yarn configuration represents a preferred direction in consideration of a process pass-through capability and fabric appearance and grades.

[0008]

The covering draft for the polyurethane elastic yarn in the manufacture of covered elastic yarn C should be in the range 2.0 to 4.0, preferably, 2.5 to 3.5. A covering draft in the region less than 2.0 will make it difficult to achieve appropriate kickback[recovery] properties, in addition, or will end up consuming a large amount of an expensive polyurethane elastic yarn, raising the cost of the fabric itself. On the other hand, a range exceeding 4.0 will cause the kickback [recovery] to be too strong, thereby adversely affecting the weaving or dyeing process pass-through capability, an undesirable condition.

[0009]

The greater the number of twists (number of covering twists) for the synthetic fiber multifilament yarn B for the production of covered elastic yarn C, the higher the extent of rendering the yarn uniform and the greater resistance to a thread exposure, whereas an excessively increased number of twists, which is not preferred, will give a product poor in bulkiness, in addition, hindering the elongation and recovery of the polyurethane elastic yarn. The number of twists (number of covering twists) should be such that the twist coefficient K as drawn during the manufacture of the covered elastic yarn should be in the range 3000 to 10000, preferably, 4500 to 9000, particularly 4500 to 7500. A twist coefficient in a region less than 3000 will make it difficult to achieve an appropriate covering configuration with the filament yarn ending up insufficiently ordered ; on the other hand, a range exceeding 10000 will cause the yarn to be ordered, but will lose the bulkiness, beside resulting in a high yarn twisting cost in practice, which makes such a range not preferred.

[0010]

It is preferred for the percent elongation of the stretch woven fabrics manufactured not to be particularly limited but preferably be at least 10% as the elongation in the fabric warp direction prescribed in JISL-1096 (Method A: constant speed elongation method). An extension less than a range of 10% leads to insufficient stretchability, not readily satisfying the performance requirements for women's lower torso applications such as pants.

[0011]

The synthetic fiber multifilament yarn B which constitutes the covered elastic yarn C is preferably a false-twisted yarn generated by false twisting a thermoplastic synthetic fiber multifilament or a polyester differential shrinkage blended multifilament yarn containing a self-extendable yarn, but optionally, one may use a multifilament yarn composed of a thread-forming

polymer such as polyamide, polyolefin, or the like. The polyurethane elastic yarn A, on passing through a covering step, is substantially covered with a synthetic fiber multifilament yarn B, where if said synthetic multifilament yarn B were in a flat yarn configuration without filament processing, the product would not only have a waxy feel, but also the monofilaments, which would have not been opened and have piled up in a film-like manner would not be able to have a good covering configuration, and this would also produce a product with an offensive gloss. Using the above false-twisted yarn or a differential shrinkage blend yarn containing a self-extendable yarn can provide a soft hand free of waxiness, in addition, with the effect of unbundling, the monofilaments will cleanly cover the polyurethane elastic yarn A; the covered elastic yarn C itself will become more uniform, which is preferred.

[0012]

The above covered elastic yarn C is sized as drawn to a draw ratio 0.6 to 1.0 times that applied when the covered elastic yarn was produced, and then dried at 20 to 70°C. The sizing agent is preferably a hot-melt sizing type, a non-aqueous sizing agent made up of a hot meltable polymer and a wax agent. While acrylic type sizing agent and PVA extensively used as sizing agents are aqueous sizing agents, the hot-melt size type non-aqueous sizing agent does not require removal of water avoiding a fall in production efficiency. An effective coverage of the surface of the covered elastic yarn with the resin [sizing]agent prevents the twists of the polyurethane elastic yarn B and synthetic fiber multifilament yarn C from shifting relative to each other, an effect of preventing a breakdown or thread exposure of the polyurethane elastic yarn, which has extremely low frictional strength. In addition, the sizing agent solidifies without increasing the drying temperature so that there is only a minimal loss in filament yarn physical properties among its advantages. The hot-melt size type non-aqueous sizing agent preferably uses a mixed sizing agent of a heat meltable polymer such as an acrylate ester or methacrylate ester based agent and a wax such as an α olefin polymer. An applied level less than 3% by weight of the fiber weight will fail to cover sufficiently the surface of the covered elastic yarn, resulting in poor interlocking, thread exposure, or yarn breakdown of the polyurethane elastic yarn. A range exceeding 7% by weight is not preferred not only because of increased waste, but also because of an induced soiling through the process steps and a drop in scouring capabilities.

[0013]

The covered elastic yarn C may be scoured either online before it is wound up or offline after it has been wound up, but it is preferred to size online before it is wound up for simplification of process steps. The preferred conditions for drying-sizing call for drying at 20 to 70°C under drawn condition of 0.6 and 1.0 times the covering draft. If the sizing and drying are carried out at a draw ratio in a range exceeding 1.0 times the covering draft, this will mean a long term fixation under such a configuration, so that when this is made into a woven fabric, it will be difficult to develop sufficiently high stretch capabilities. A range less than 0.6 times the covering draft will fail to permit the covered elastic yarn C to sufficiently extend in subsequent steps such as warped yarn sizing or warping, only to produce a poorly stretchable woven fabric.

[0014]

With respect to the drying temperature conditions, it is preferred to dry the sizing agent at 20 to 70°C, preferably, at 35 to 45°C. A temperature condition below 20°C will require a much longer time for completing the drying which makes it not only impossible to increase the process speed, but also easy for the poor drying to induce a yarn breakdown due to the adhesion of yarn to itself at the time of opening the covered elastic yarn. A [temperature] range exceeding 70°C may shorten the time required for drying, but the scouring capability in dyeing steps will be reduced compared to lower temperature drying conditions, which is not preferred.

[0015]

The process for manufacture of stretch woven fabrics of this invention calls for using for the warp, in addition to the above covered elastic yarn C, a synthetic fiber multifilament yarn D, where it is preferred for the covered elastic yarn C and the synthetic fiber multifilament yarn D to be arrayed alternatingly 1:1 to 1:4 in a ratio. A ratio equal to or greater than 1:5 will make it difficult to obtain stretch capabilities, tending to undesirable induction of residual strain after elongation, a phenomenon called "set". Making up the fabric entirely from covered elastic yarn will provide a product with good kickback [recovery] properties, but will end up finishing a product with a bulkiness-free hand, in addition, an expensive product not preferred for common apparel applications. It is preferred for the synthetic fiber multifilament yarn D to be a polyester multifilament yarn, but it is permissible to use a multifilament yarn made up of a thread-forming polymer such as polyamide, polyolefin, and the like.

[0016]

Furthermore, using a differential shrinkage polyester blend yarn, further a differential shrinkage blend yarn containing a self-extending yarn for the synthetic fiber multifilament yarn D, in addition to the covered elastic yarn C for constituting the warp of the stretch woven fabrics of this invention, is suitable for improving fiber appearance and hand. It is difficult for a conventional polyester drawn yarn or a thick-and-thin yarn to achieve suitable bulkiness, resulting in a product with a residual waxiness; so that if made into a false-twisted yarn or structurally processed yarn, the product will have a cheap, novelty-free hand as in the case of wooly pongee type. The differential shrinkage polyester blend yarn is obtained by pneumatically entangling and mixing by a known method two or more polyester multifilament yarn types with different thermal shrinkages. Herein, the definition of a self-extending yarn points to a multifilament yarn having a hot water shrinkage SHW to be less than 0%, substantially a negative SHW value.

[0017] For a warp preparation of the stretch woven fabrics of this invention, this can be largely divided into one--prepared using a warp sizer or the like dependent on the number of true twists inserted into the above covered elastic yarn C and alternatingly arrayed synthetic fiber multifilament yarn D--and one prepared by partially warping. There is no limitation to the number of twists inserted into said synthetic fiber multifilament yarn D, which number may be suitably selected, depending upon the objective hand or application and the like. Since the covered elastic yarn C and the synthetic fiber multifilament yarn D have different elongations, it becomes important to reduce, as far as possible, the differences in tension imposed on the yarn by means of a tension device for improved appearance and grade of the resultant woven fabrics. In the case of using a partial warp machine, special care must be exercised because there are tendencies for stripe-shaped defects generally called "koro" stripes to form due to the differences in tension at every warp section.

[0018]

For the above warp preparation, sizing and/or warping is carried out wherein the yarn tension applied to the multifilament yarn D should be in the range 0.09 to 0.27cN/dtex, preferably 0.09 to 0.18cN/dtex. A lower tension below 0.09cN/dtex is not preferred because the yarn will slacken and will entangle, an undesirable cause for a yarn breakdown. A high tension exceeding 0.27cN/dtex can hardly be an acceptable region because this will

induce a yarn breakdown on application of a tension in the warping and weaving steps, so that it is preferred to carry out as above in the tension ranging from 0.09 to 0.27cN/dtex.

[0019].

Preferred sizing conditions call for a reduction in the temperatures for sizing and drawing if the multifilament yarn D constituting the yarn other than covered elastic yarn is a differential shrinkage blend yarn. In particular, the high shrinkage yarn side of the differential shrinkage blend yarn is a isophthalate copolyester or copolyester of a bisphenol ethylene oxide adduct, or in the case of a polyester filament in which the low shrinkage side yarn is substantially self-extending, or else in the case of the above high shrinkage yarn and low shrinkage yarn being the above combination, it will be preferred for the sizing temperature to be in the range of 40 to 50°C, and the drying temperature of 60 to 90°C, more preferably, in the range 60°C to 70°C. There is no particular limitation as to the type of sizing agent, and any known type can be used.

[0020]

There are no limitation as to the type of machine for looming, and the invention may be carried out using known types such as a water jet loom, air jet loom, rapier loom, projectile loom and the like. For better productivity, a water jet loom is preferred. Incidentally, the use of a water jet loom will require drying the raw product; particularly in the case of the multifilament yarn D being a differential shrinkage blend yarn, the yarn treatment temperature for the raw product should be in the range of 50 to 70°C, preferably 55 to 65°C, more particularly, 55 to 60°C.

[0021]

[Examples]

The present invention is further specifically explained based on examples below, but will not be limited in any way to these examples. The physical properties and characteristic values for examples of this invention and comparative examples in the text were calculated according to the following measurement procedures:

(Boiling water shrinkage SHW)

A sample yarn is rewound at a rate of 120 turns per minute under an initial load of 0.09g/dtex on a measurement device with a 1.125m frame circumference, thereby generating a small hank with 20 turns and measuring the hank length L_0(mm) under a load 40 times the initial load. The load is

removed, the sample is then immersed 30 minutes in boiling water at 98°C±2°C under conditions of not interfering with its shrinking, followed by air drying with the yarn kept at a level state. After air-drying, a load of 0.09g/dtex is applied again to measure hank length L1(mm), whereby the boiling water shrinkage (SHW) is computed according to the following equation: Incidentally, an average of 5 runs is reported as the measured value.

SHW (%) = (L0-L1)/L0x100

[0022]

(Twist Coefficient K)$$$$

Twist coefficient K is calculated from the following equation:

$K=\sqrt{D} \times T_w$

Where D is the total yarn fineness (decitex); T_w is the number of twists (turns/m) per meter of the yarn.

[0023]

(Elongation)

Percent elongation of a sample in the warp direction is measured according to JISL-1096 (method A: constant speed elongation method), 1998 Edition.

[0024]

(Experimental Examples 1 and 2)

A polyurethane elastic yarn A, ESPA 22 decitex monofilament by Toyobo Company was drawn to a draft ratio of 2; covered with a synthetic fiber multifilament yarn B by a conventional covering device in the S twist direction at 1000 turns/m, generating a singly covered yarn; before being wound up, it was sized, under a tension 0.7 times the covering draft(2.5X), with a hot-melt sizing agent comprised of a 45:55 weight ratio of an ethylene methacrylate ester and a [poly] α-olefin at a proportion of 3 % by weight of said covered yarn; and dried at a drying temperature of 30°C producing a covered elastic yarn C.

[0025]

The synthetic fiber multifilament yarn B used for Example 1 was a polyester multifilament semi-dull false-twisted yarn: 56 decitex, 24 filaments (SHW=4.5%). For Example 2, use was made of a polyester multifilament differential shrinkage blend yarn: 66 decitex, 36 filaments [heat shrinkable component : 33 decitex, 18 filaments (SHW=13%) x heat

C-sized covered → sized → Beam
D

extensible component: 33 decitex, 18 filaments (SHW=-3.5%)] containing a self-extending yarn.

[0026]

For the synthetic fiber multifilament yarn D, in addition to the above covered elastic yarn C used for the warp, use was made of a polyester multifilament differential shrinkage blend yarn containing a self-extending component: 66 decitex, 36 filaments [heat shrinkable component 33 decitex, 18 filaments (SHW=13%) x heat extensible component 33 decitex, 18 filaments (SHW=-3.5%)], to which true twists were inserted in the S twist direction at 450 turns/m, followed by arraying the multifilament yarn D and the covered elastic yarn C to provide an alternating construction as a 1:1 thread, and followed by a warp sizing by means of warp sizer at a sizing temperature of 50°C and a chamber environment temperature of 70°C under a filament yarn D yarn tension of 0.14cN/dtex for Example 1, and 0.19cN/dtex for Example 2; the sizing agent was prepared from PVA and an acrylic sizing agent.

[0027]

A piece of 5-harness satin weave raw fabric was prepared with the above sized yarn as the warp, to which were inserted polyester multifilament twisted yarn (twist turns = 2500 turns/m) (SHW=6%): 84 decitex, 72 filaments (SHW=6%) as the weft so as to have a construction of two alternating threads in the S twist and Z twist.

[0028]

The resultant raw fabrics in extended sheeting were continuously pre-scoured, followed by a liquid flow scouring, relaxing and then pre-setting using a heat setter under a condition of 180°C. This was then subjected to a 10% alkali reduction treatment and to a high pressure dyeing with a dispersion dye using a liquid flow dyeing machine, followed by a thorough reduction washing, applying a finishing resin for a finishing set at 160°C to finish densities of 324 warp threads/in and 122 weft threads/in. These woven fabrics were finished to have their warp directional elongation of 14.5% and 13.2% respectively, sufficient stretch capabilities, which in addition had a refined gloss, a soft hand, bulkiness suitable for women's outer apparel applications.

[0029]

[Experimental Example 3]

For the polyurethane elastic yarn A, ESPA 33 decitex monofilament by Toyobo Company was drawn to a draft ratio of 2.5; covered with a synthetic fiber multifilament yarn B, by a conventional covering device, in the S twist

direction at 1000 turns/m, generating a singly covered yarn; before being wound up, it was sized, under a tension 0.8 times the covering draft(2.5X), with a hot-melt sizing agent comprised of a 45:55 weight ratio of an ethylene methacrylate ester and a [poly]α olefin at a proportion of 3 % by weight with respect to said covered yarn; and dried at a drying temperature of 35°C producing a covered elastic yarn C.

[0030]

Use was made of a polyester multifilament differential shrinkage blend yarn containing a self-extending yarn: 117 decitex, 54 filaments [heat shrinkable component : 84 decitex, 36 filaments (SHW=15%) x heat extensible component: 33 decitex, 18 filaments (SHW=-3.5%)].

[0031]

For the synthetic fiber multifilament yarn D, in addition to the above covered elastic yarn C for the warp, use was made of a polyester multifilament differential shrinkage blend yarn containing a self-extending component: 117 decitex, 54 filaments [heat shrinkable component 84 decitex, 36 filaments (SHW=13%) x heat extensible component 33 decitex, 18 filaments (SHW=-3.5%)] to which true twists were inserted in the S twist direction at 1000 turns/m, followed by arraying multifilament yarn D and covered elastic yarn C to be a 4:1 thread alternating construction, which was then subjected to warping using a partial warping machine under a yarn tension of 0.14cN/dtex for the multifilament yarn D.

[0032]

A back satin/Amundsen[or Amunzen] structured raw fabric was prepared with the above yarn as the warp, to which were inserted a polyester multifilament twisted yarn as the weft (twist turns = 2200 turns/m) (SHW=5.5%): 110 decitex, 96 filaments (SHW=5.5%) so as to have a construction of two alternating threads in the S twist and Z twist.

The back satin Amundsen structure was: Amundsen: satin (5-harness satin) = 1:4; the weaving was carried out in such a way to incorporate the covered elastic yarn C into the portion constituting the Amundsen structure.

[0033]

The procedure of Examples 1 and 2 was used to dye and finish to give a dyed fabric with a density of 204 warp threads/in and 107 weft threads/in. Said fabric had a warp directional elongation of 12.8% and suitable stretchability, thereby being a finished product that shows a natural

bulkiness, soft hand, and suitable drape, suitable for women's outer apparel such as women's jackets, pants, suits, and the like

[0034]

(Example 4)

A dyed fabric was prepared by a method similar to that of Example 2, except for changing the array of the covered elastic yarn C and synthetic fiber multifilament yarn D to 1:6. The finished density was 326 warp threads/in and 115 weft threads/in. The resultant dyed fabric was rich in bulkiness, soft hand, and drape with an acceptable appearance and grade, but it had a warp directional elongation of 8.2%, a level insufficient in stretchability as a stretch woven fabric. It also had a residual strain called "set", and the product could not be finished to be favorable for apparel applications.

[0035]

(Experimental Example 5)

The covered elastic yarn C used in Example 2 alone was warped, followed by the same procedure as that of Example 2 to obtain a dyed fabric. The finished density had 326 warp threads/in and 130 weft threads/in. The resultant dyed fabric had an acceptable appearance and grade and had a warp directional elongation of 16.8%, thereby showing sufficient stretch capability, but it had too strong kickback [recovery], was poor in drape, and had a strong feel of tension, resulting in a finished product with a rather heavy fabric weight. Since the covered elastic yarn was used in all the warp, the product was expensive.

[0036]

(Experimental Example 6)

A procedure similar to Experimental Example 2 was applied to obtain a dyed fabric with 324 warp threads/in and 124 weft threads/in using the covered elastic yarn C and synthetic fiber multifilament yarn D used in Experimental Example 2 by weaving in an alternating thread array of 3:5. A stripe-like puckering generated in the warp direction to give a [seer] sucker woven type hand, failing to given a product with a good appearance and grade.

[0037]

(Experimental Example 7)

The same procedure as that of Example 2 was used to obtain a dyed fabric except for increasing the number of covering twists for the covered elastic yarn C in the S twist direction to 1200 turns/m. The finished density was 322 warp threads/in and 120 weft threads/in. The dyed fabric had

acceptable appearance, grade, good hand, and drapability, but had a warp directional elongation of 9.2%, somewhat inferior in stretchability and insufficient kickback [recovery] properties.

[0038]

(Experimental Example 8)

A dyed fabric was obtained by the same procedure as that of Experimental Example 2 except for reducing the number of covering twists for the covered elastic yarn C in the S twist direction to 300 turns/m. The finished density was 324 warp threads/in and 122 weft threads/in. The dyed fabric had poor configuration for covering the covered elastic yarn C causing the polyurethane elastic yarn A to be exposed on the surface, a thread exposure, failing to give a good appearance and grade.

[0039]

(Experimental Example 9)

The same procedure as Example 2 was used except for changing the covering draft for the polyurethane elastic yarn A to 1.5 to generate a covered elastic yarn C to be finished with a finish density of 324 warp threads/in and 118 weft threads/in. The dyed fabric had a warp directional elongation of 18.2% with sufficient stretchability, but was inferior in kickback [recovery] properties along with a high fabric unit weight, giving a distended feeling product.

[0040]

(Example 10)

The same procedure as that of Example 2 was used except for producing the covered elastic yarn C at a covering draft of 4.5 for the polyurethane elastic yarn A to give a dyed fabric with a finished density of 323 warp threads/in and 133 weft threads/in. The dyed fabric had a warp directional elongation of 6.8%, somewhat lower for stretchability, but had too high kickback [recovery] properties, failing to provide a product good for women's outer apparel applications.

[0041] [Table 1]

	Warp									Weft		Weaving		Stretch Characteristics	
	Covered Elastic Yarn C					Multifilament Yarn D		C/D Array Ratio	Warp Preparation (cN/dtex)	Decitex/filament	No. of True Twists	Structure	Finished Density (threads/in) Warp and Weft	Elongation (%)	Ratings *
	Polyurethane Elastic Yarn A	Covering Draft	Multifilament Yarn	Covering Configuration	Number of Covering Twists	Decitex/filament	Number of True Twists								
Experimental Ex. 1	22dtex/1fil	2.5	56dtex/24fil. ESF false-twisted yarn	SCY	S 1000T/m K=8050	66dtex/36fil. Self-extending blend Yarn	S 450T/m	1/1	Sizing 0.21	84dtex/72fil ESF medium shrinkage yarn	SZ 2500T/m	5-harness Satin	(324,122)	14.2	A
Experimental Ex. 2	22dtex/1fil	2.5	66dtex/36fil Self-extending blend yarn	SCY	S 1000T/m K=8650	66dtex/36fil. Self-extending blend Yarn	S 450T/m	1/4	Sizing 0.19	84dtex/72fil ESF medium shrinkage yarn	SZ 2500T/m	5-harness Satin	(324,122)	12.5	A
Experimental Ex. 3	22dtex/1fil	2.5	66dtex/36fil Self-extending blend yarn	SCY	S 600T/m K=6845	117dtex/54fil. Self-extending blend Yarn	S 1000T/m	1/6	Partial Warping 0.14	110dtex/96fil ESF medium shrinkage yarn	SZ 2200T/m	Back Satin Amundsen	(204,107)	10.5	B
Experimental Ex. 4	33dtex/1fil	2.5	66dtex/36fil Self-extending blend yarn	SCY	S 1000T/m K=8650	66dtex/36fil. Self-extending blend Yarn	S 450T/m	1/0	Sizing 0.19	84dtex/72fil ESF medium shrinkage yarn	SZ 2500T/m	5-harness Satin	(326,115)	8.5	C (set)
Experimental Ex. 5	22dtex/1fil	2.5	66dtex/36fil Self-extending blend yarn	SCY	S 1000T/m K=8650	NOT USED	NOT USED	3/5	Sizing 0.19	84dtex/72fil ESF medium shrinkage yarn	SZ 2500T/m	5-harness Satin	(326,130)	15.2	C
Experimental Ex. 6	22dtex/1fil	2.5	66dtex/36fil Self-extending blend yarn	SCY	S 1000T/m K=8650	66dtex/36fil. Self-extending blend Yarn	S 450T/m	1/1	Sizing 0.19	84dtex/72fil ESF medium shrinkage yarn	SZ 2500T/m	5-harness Satin	(324,124)	13.4	C (puckering)
Experimental Ex. 7	22dtex/1fil	2.5	66dtex/36fil Self-extending blend yarn	SCY	S 1200T/m K=1038	66dtex/36fil. Self-extending blend Yarn	S 450T/m	1/1	Sizing 0.19	84dtex/72fil ESF medium shrinkage yarn	SZ 2500T/m	5-harness Satin	(322,120)	8.3	C
Experimental Ex. 8	22dtex/1fil	2.5	66dtex/36fil Self-extending blend yarn	SCY	S 300T/m K=2595	66dtex/36fil. Self-extending blend Yarn	S 450T/m	1/1	Sizing 0.19	84dtex/72fil ESF medium shrinkage yarn	SZ 2500T/m	5-harness Satin	(324,122)	13.2	C (PU exposed)
Experimental Ex. 9	22dtex/1fil	1.5	66dtex/36fil Self-extending blend yarn	SCY	S 1000T/m K=8985	66dtex/36fil. Self-extending blend Yarn	S 450T/m	1/1	Sizing 0.18	84dtex/72fil ESF medium shrinkage yarn	SZ 2500T/m	5-harness Satin	(324,118)	17.8	D
Experimental Ex. 10	22dtex/1fil	4.2	66dtex/36fil Self-extending blend yarn	SCY	S 1000T/m K=8440	66dtex/36fil. Self-extending blend Yarn	S 450T/m	1/1	Sizing 0.21	84dtex/72fil ESF medium shrinkage yarn	SZ 2500T/m	5-harness Satin	(326,133)	7.4	B

* Evaluation was based on the following 6-step ratings, including appearance and grade.

A: Good appearance and grade, and kickback [recovery] properties; good touch and drape.

B: Moderate appearance and grade; good touch and drape.

C: Moderate appearance and grade; insufficient kickback [recovery]; good touch and drape.

D: Bad appearance, grade and kickback [recovery] properties; good touch and drape.

E: Moderate appearance and grade; too strong in kickback [recovery] properties; insufficient drape; heavy.

F: Bad appearance and grade; good kickback [recovery]; good touch and drape.

[0042]

The present invention permits manufacturing highly stretchable synthetic fiber woven fabrics regardless of fabric width, enabling one to respond in a flexible manner to meet customer wishes. The invention also enables suppression of the fabric width irregularity, weave band, fitting in shade, and the like problems. A conventional warp stretched woven fabrics requires a rather large reed width, limiting the type of loom that can be used. The warp stretching can, without needing a large reed width, improve the weft insertion of a loom and can also provide advantageous effects such as cost reduction and the like.

Trans: Language Services
Chemical Japanese Services
April 29, 2003